Pavley I + Low Carbon Fuel Standard Postprocessor
Version 1.0

User's Guide

California Environmental Protection Agency

AIR RESOURCES BOARD

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User's Guide

ARB staff has developed this tool for Metropolitan Planning Agencies (MPO) to use as they estimate the greenhouse gas reductions (GHG) from local land use strategies when those strategies are combined with California's vehicle and fuel standards. In 2007, ARB adopted the Pavley clean-car standards to reduce GHG emission from passenger vehicles. In 2009, ARB adopted a Low Carbon Fuel Standard (LCFS) to reduce the carbon intensity of vehicle fuel. Now, under SB 375, MPOs and local governments are developing plans to reduce our driving needs as our communities grow. This tool allows the MPOs to estimate how the three strategies work together to reduce emissions.

MPOs will take the information about vehicle use (e.g., miles driven and speeds) coming out of their alternative planning scenarios and use that as input to ARB's existing vehicle emission model EMFAC. The MPOs will then put the EMFAC output into this tool to estimate future GHG emissions with the Pavley and LCFS benefits. ARB will use the same tool when it sets the GHG emission reduction targets required by SB 375.

The Pavley I + LCFS Postprocessor (Version 1.0) was developed to adjust the carbon dioxide (CO_2) emissions from the EMFAC 2007 Ver2.3 output to account for the reductions from the adopted Pavley I regulation and Low Carbon Fuel Standard (LCFS) on the light duty fleet – Passenger Cars [Light Duty Automobiles (LDA)], Light Duty Trucks [0 – 3,750 lbs (LDT1)], Light Duty Trucks [3,751 – 5,750 lbs (LDT1)], and Medium-Duty Trucks [5,751 – 8,500 (MDV)]. The postprocessor is designed to work as a stand-alone Microsoft Windows-based program that is applied to the EMFAC Burden output (".bdn" extension) to calculate the adjusted CO_2 emissions.

The Postprocessor is coded as a Microsoft® Office Excel Macro to automate the calculations. In order to make the postprocessor user friendly, a simple Visual Basic interface has been added so that users can execute the macro as a Windows program. First time users will need to install the program on their computers. Once installed, the program can be directly executed from either the Start menu or a Desktop icon for subsequent assessment. This User's Guide details the step-by-step procedure to install and execute the program.

Background

Since the last version of EMFAC (EMFAC2007 Ver2.3) was released in 2007, it does not reflect the new regulations adopted by ARB after 2007. In particular, ARB has adopted two regulations that significantly affect the CO_2 emissions:

- Pavley I: A clean-car standard to reduce greenhouse gas (GHG) emissions from new passenger vehicles (LDA-MDV) from 2009 through 2016 (reduction factors are presented in Table 1)

- Low Carbon Fuel Standard: A fuel standard that requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020 (reduction factors are presented in Table 2)

Table 1: Pavley I Reduction Factors

Model Year	LDA/LDT1	LDT2/MDV
2008 and older	0.00%	0.00%
2009	0.00%	0.90%
2010	3.50%	5.20%
2011	14.40%	12.00%
2012	25.30%	18.50%
2013	27.20%	19.90%
2014	28.80%	21.00%
2015	31.70%	23.00%
2016 +	34.30%	25.10%

Table 2: LCFS Reduction Factors*

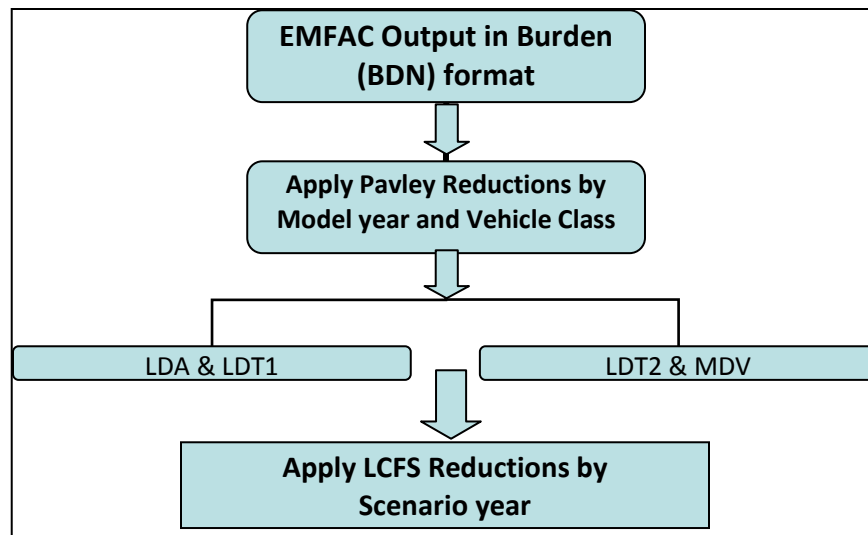| Calendar Year	Reduction Factor
2010	Reporting Only
2011	0.25%
2012	0.50%
2013	1.00%
2014	1.50%
2015	2.50%
2016	3.50%
2017	5.00%
2018	6.50%
2019	8.00%
2020 +	10.00%

* Based on the carbon intensity reductions required by the LCFS Regulation for transportation fuels used in California as provided from the Staff Report titled "California's Low Carbon Fuel Standard" dated October 2009. Measured on a lifecycle basis, the carbon intensity represents the equivalent amount of carbon dioxide (CO_2e) emitted from each stage of producing, transporting, and using the fuel in a motor vehicle.

Process Flowchart

This section details the Postprocessor operation flow. The Detailed EMFAC Burden output (".bdn" extension) was selected as the input for the Postprocessor since it can provide output by vehicle model year and vehicle class, which is required for applying the Pavley factors. The Postprocessor extracts CO_2 emission data for passenger vehicles (LDA, LDT1, LDT2, and MDV) from the Burden output. It then applies the Pavley reduction factors to the CO_2 emissions by vehicle model year and vehicle class. After adjusting the CO_2 data for Pavley I reductions, the Postprocessor aggregates the total

CO$_2$ emissions for each vehicle class. Finally, the Low Carbon Fuel Standard reduction factors are applied to the data based on scenario/calendar year and vehicle class.

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┌─────────────────────────────────────────────────────┐
│           EMFAC Output in Burden                     │
│               (BDN) format                           │
│                     ↓                                │
│           Apply Pavley Reductions by                 │
│           Model year and Vehicle Class               │
│                     ↓                                │
│      ┌──────────────┐        ┌──────────────┐        │
│      │  LDA & LDT1  │        │  LDT2 & MDV  │        │
│      └──────────────┘   ↓    └──────────────┘        │
│           Apply LCFS Reductions by                   │
│               Scenario year                          │
└─────────────────────────────────────────────────────┘
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System Requirements

The program will run on any Intel-based PC running Windows 95/Windows NT 4.0 or newer. The installation will require 1 MB of disk space for the installed files. At least 64 MB of RAM is required. The program requires Microsoft® Office Excel Version 2000 or newer to be installed on the system. Typical output files will require less than 1 MB.

Input Data Requirements

Before using the Postprocessor, users will need to run EMFAC and generate the appropriate output files. Users can either create an EMFAC default scenario, or use the WIS to adjust VMT and speed distribution to create a new scenario. For estimating CO_2 emissions for SB375 purposes, if a new scenario is created that has a different target VMT, users should directly adjust the VMT rather than change the vehicle population to achieve the target VMT. The WIS can be accessed by clicking on the "Edit Program Constants" button.

The Postprocessor can only be applied to one scenario containing one calendar year at a time. Therefore, users should create separate EMFAC model outputs for each region and calendar year scenario, and run the Postprocessor for each output separately.
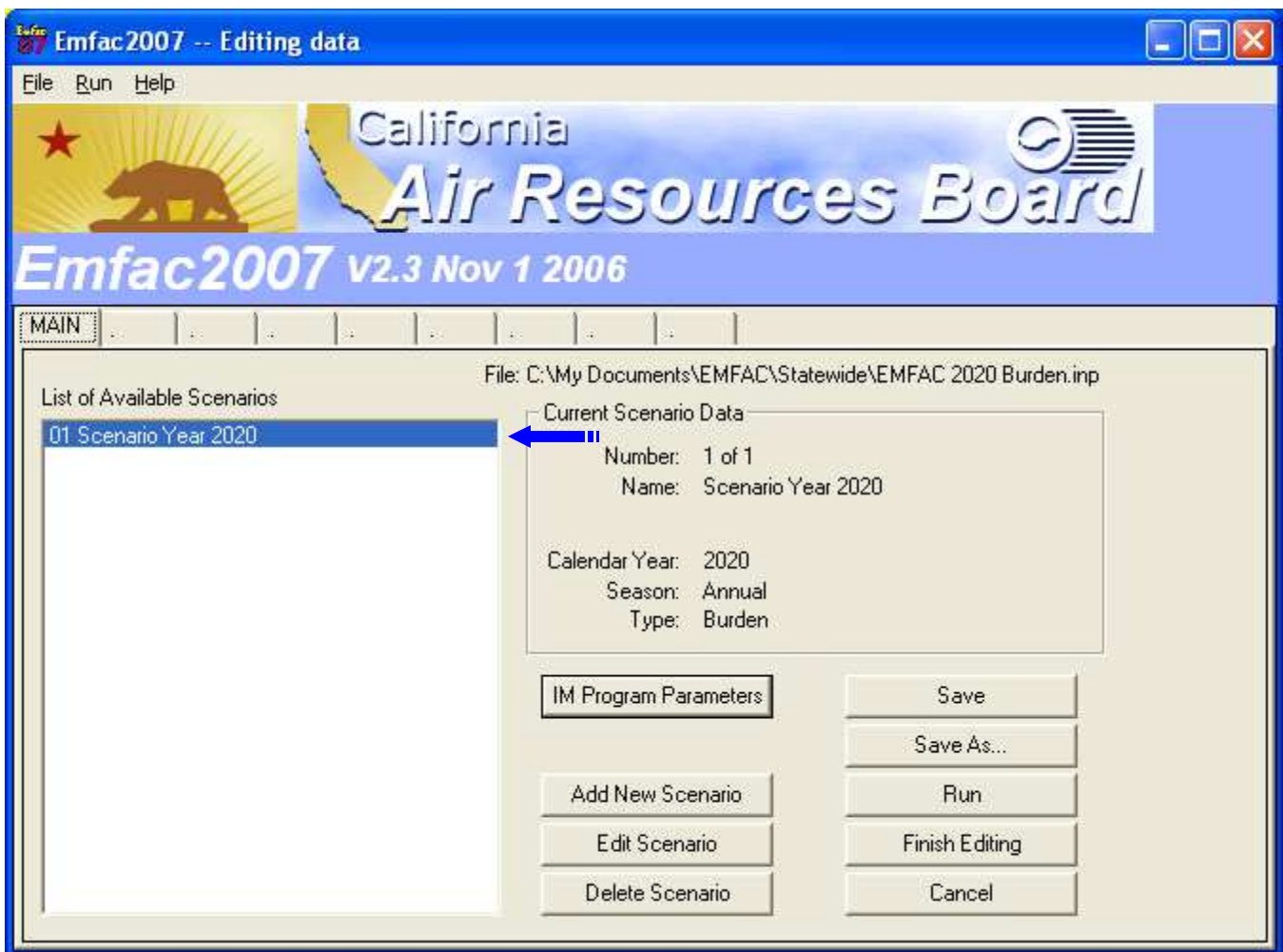
Since the Sub-Area runs create multiple output scenarios in the same output file, the Postprocessor <u>can only be applied to outputs created using "Use Average" option</u>. For special instructions to process Sub-Area cases, please contact Jonathan Taylor at ARB [jtaylor@arb.ca.gov – (916) 445-8699].

The Postprocessor can only be applied to an EMFAC Detailed Burden Output (files with ".bdn" extension). A Burden run can be generated by selecting the "Burden - Area Planning Inventory" option in the "Mode and Output" tab.
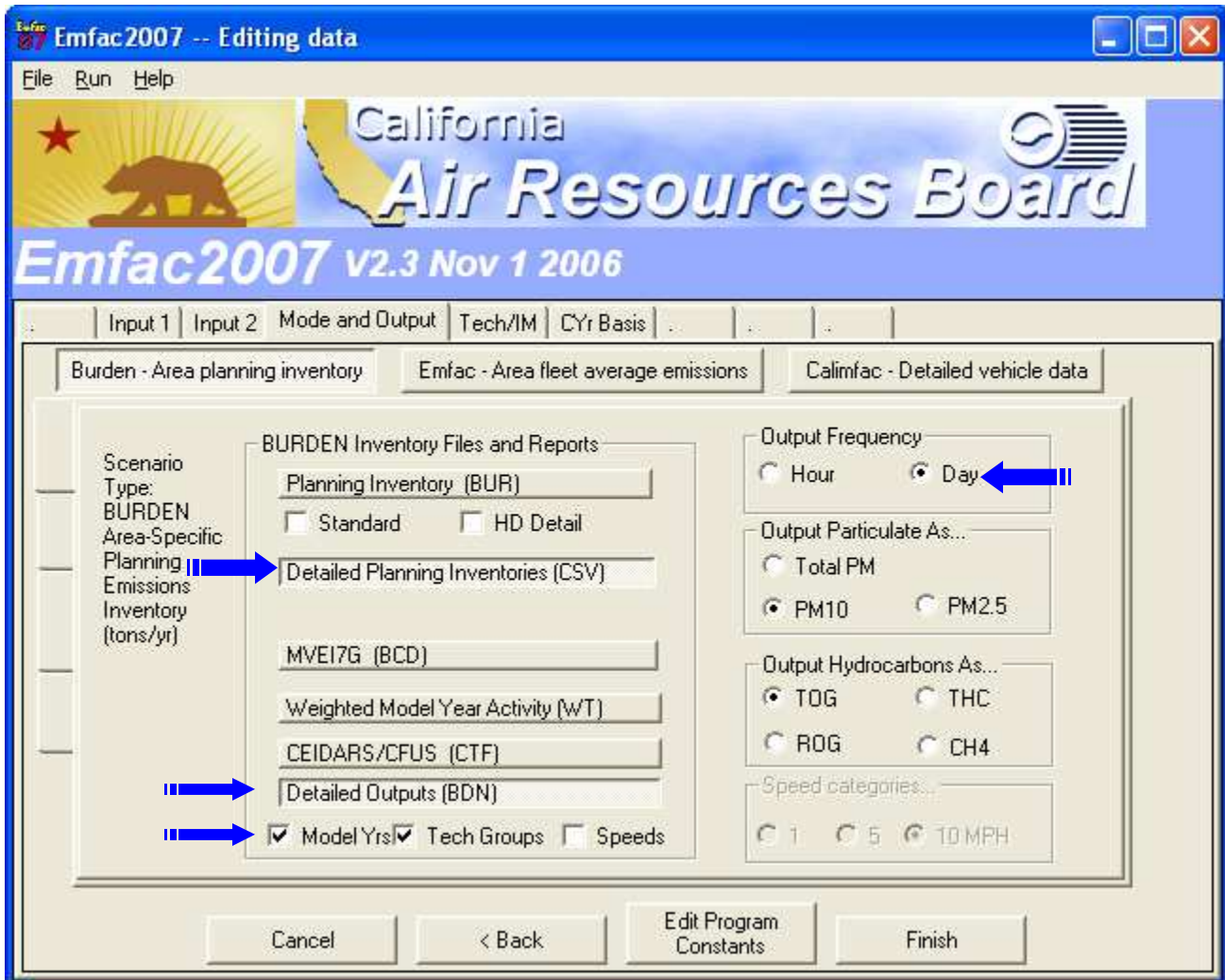
The following options should be selected during an EMFAC Burden run for compatibility with the Postprocessor:

- *Detailed Planning Inventories (CSV)*
- *Detailed Outputs (BDN)*
- *Model Yrs*
- *Tech Groups*
- *The Output Frequency should be checked for "Day"*

For more information regarding the EMFAC model and Burden output, refer to the EMFAC 2007 v2.3 User's Guide
<http://www.arb.ca.gov/msei/onroad/latest_version.htm>.

Installation Procedure

The Pavley I + LCFS Postprocessor installation files are compressed in a ZIP file which is posted at http://www.arb.ca.gov/cc/sb375/tools/postprocessor.htm. First time users will need to download and install the files. The program can be installed by following a three-step procedure:

1. Download
2. Extract
3. Install

Step 1 – Download

1. Go to http://www.arb.ca.gov/cc/sb375/tools/postprocessor.htm
2. Right-click on the "Pavley I + LCFS Postprocessor (Ver1.0) Installation File" link, and select the "Save Target As" option to save the file to the Desktop

Step 2 – Extraction

1. Double click on the "pavleylcfs-postprocessor-v1.exe" file to extract the files.

2. This opens up a WinZip Self-Extractor window
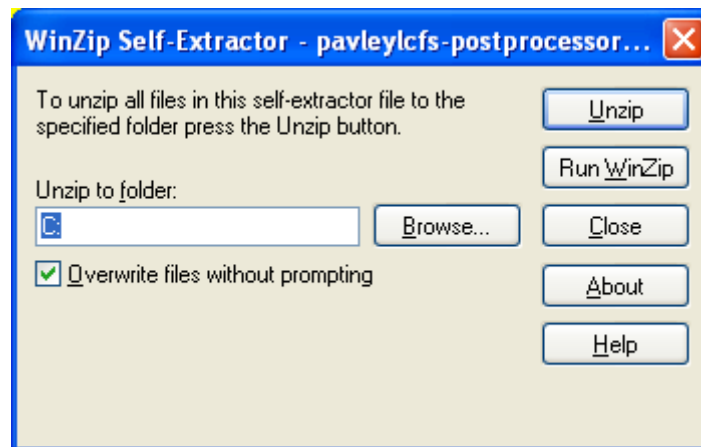
3. In the "Unzip to folder" field, select the C Drive (C:)
4. Check the "Overwrite files without prompting" option
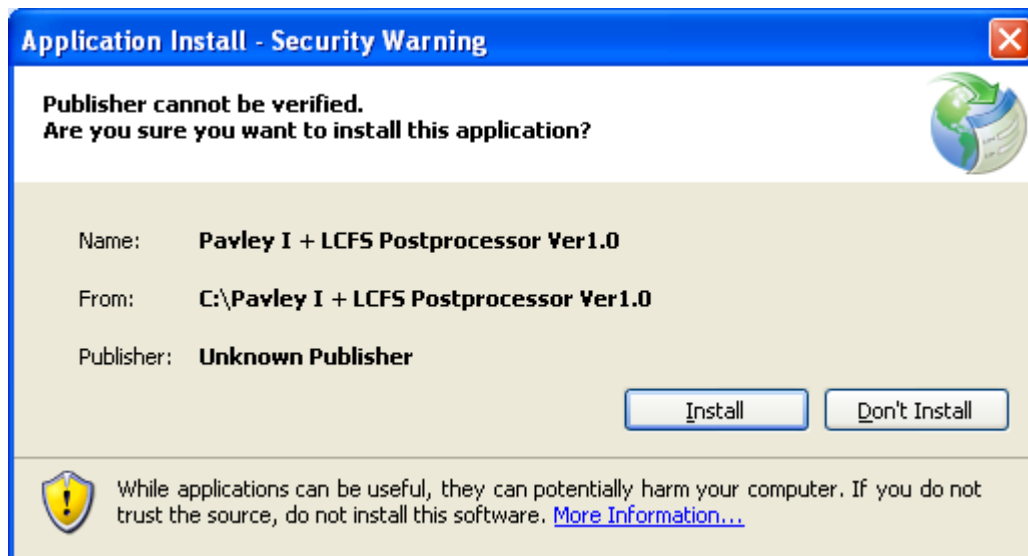5. Click on the Unzip button

This creates a new folder on the C drive [C:\Pavley I + LCFS Postprocessor Ver1.0] which contains all the Setup files.

Step 3 – Installation

1. Go to Pavley I + LCFS Postprocessor folder on the C drive [C:\Pavley I + LCFS Postprocessor Ver1.0]

2. Open the "setup.exe" file
3. Click on the "Install" button

This will install the program on the computer, and Auto-run the Postprocessor.

Software Removal

The program should be removed using the Windows "Add/Remove Programs" option on the Control Panel.

Program Execution

Once the program is installed on the computer, it can be executed from either of the two locations:

- "Pavley I + LCFS Postprocessor Ver1.0" Shortcut on the Desktop
- "Pavley I + LCFS Postprocessor Ver1.0" link in Start Menu (Program Files)
 <START> / <ALL PROGRAMS> / <CARB> / Pavley I + LCFS Postprocessor Ver1.0
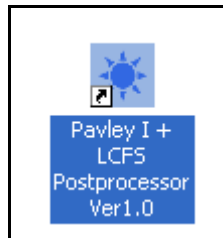
Procedure:

1. When the program is executed, a Microsoft Excel window opens up for selecting the input file (EMFAC 'BDN' Output). Browse to the EMFAC Burden Output (".bdn" extension), select the file, and click "Open".
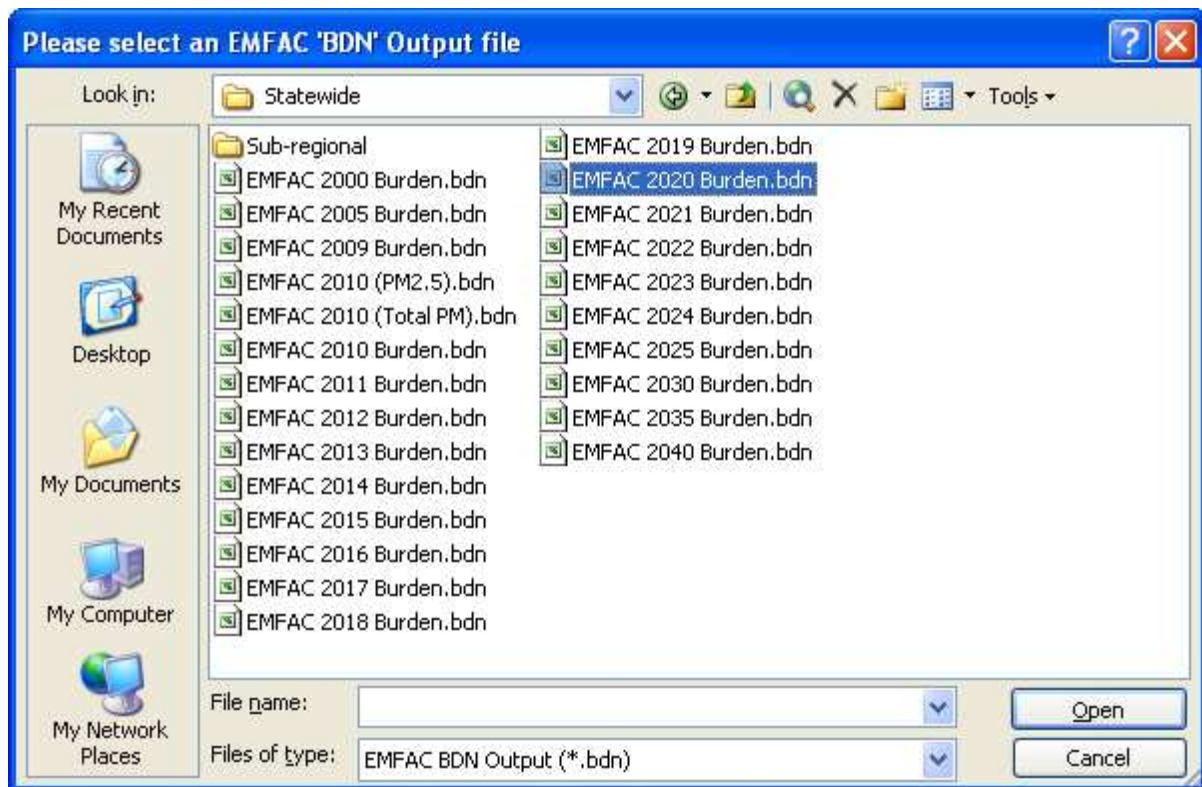
2. Once the program completes processing the data, a status message is displayed indicating the location of the saved file. Click OK to continue
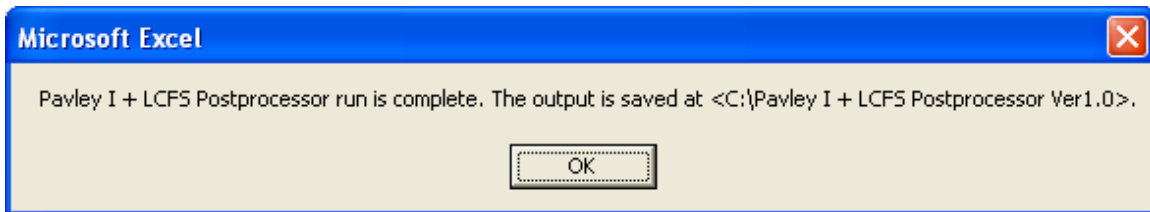
3. The output file is shown on the screen
4. The output is also saved as a Microsoft® Office Excel file to the C drive (<C:\Pavley I + LCFS Postprocessor Ver1.0> folder). The file is identified by the EMFAC Scenario and a time stamp. A sample output file is shown on Page 11

Postprocessor Output File

(Microsoft® Office Excel File Format)

Vehicle Category	Vehicle Population	Weekday VMT from EMFAC (VMT/day)	Weekday CO2 Emissions from EMFAC (tons/day)	Weekday CO2 Emission Reduction from Pavley I (tons/day)	Weekday CO2 Emissions after adopting Pavley I (tons/day)	% CO2 Emission Reduction from LCFS	Weekday CO2 Emission Reduction from LCFS (tons/day)	Weekday CO2 Emissions after adopting Pavley I & LCFS (tons/day)	Annual CO2 Emissions after adopting Pavley I & LCFS (MMTCO2/year)
LDA	15,695,341	526,108,290	226,090.60	46,933.13	179,157.47	10.00%	17,915.75	161,241.72	50.76
LDT1	3,480,904	121,578,730	64,165.48	12,193.60	51,971.88	10.00%	5,197.19	46,774.69	14.72
LDT2	6,644,752	234,684,130	127,749.70	17,230.72	110,518.98	10.00%	11,051.90	99,467.09	31.31
MDV	2,953,681	105,720,040	78,133.72	10,197.36	67,936.36	10.00%	6,793.64	61,142.73	19.25
Total	28,774,678	988,091,190	496,139.50	86,554.80	409,584.70	10.00%	40,958.47	368,626.23	116.04

CO2 Emission Reductions from the Pavley I Regulation & the Low Carbon Fuel Standard for Statewide totals - 2020 (Scenario Year 2020)

The Postprocessor summarizes the following datasets for the four passenger vehicle classes (LDA, LDT1, LDT2, & MDV):

- Vehicle population
- Weekday Vehicular Miles Travelled from EMFAC (VMT/day)
- Weekday CO_2 Emissions from EMFAC (tons/day)
- Weekday CO_2 Emission reductions from Pavley I (tons/day)
- Weekday CO_2 Emissions after adopting Pavley I (tons/day)
- % CO_2 Emission Reduction from LCFS
- Weekday CO_2 Emission Reduction from LCFS (tons/day)
- Weekday CO_2 Emissions after adopting Pavley I & LCFS (tons/day)
- Annual CO_2 Emissions after adopting Pavley I & LCFS (MMTCO$_2$/year) – Annual emissions were calculated by multiplying Average Weekday emissions (tons/day) by 347 to account for reduced vehicle activity on weekends. The annual emissions are expressed in million metric tons.

Contact Information

For questions regarding the Postprocessor, please contact:

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